

Production Technology of Soybean

Scientific name: *Glycine max*.

Family: Leguminosae.

Origin: Eastern Asia or China.

Distribution

Soybean growing countries are USA, China, Brazil and Argentina. These countries grow about 90 % of total world soybean. In Asia Pacific region soybean is cultivated in China, Pakistan and India.

Importance

Soybean contains 38-42 % protein and 17-22 % oil. Soya protein is a low cost and highly nutritious protein. It also contain essential amino acids. It is important constituent some of the infant food and milk substitutes. Soya milk are important preparation from the soybean. Soybean is rich in poly unsaturated fatty acid and more of lenoleic acid. This result in rapid oxidation and deterioration of oil quality.

Climate

- Soybean grows well in warm and moist climate.
- 26-33°C is optimum for most of the cultivars.
- Minimum temperature for effective growth is about 10°C.
- 50-70 cm rainfall with warm condition is essential in the early growth stage.
- During maturity, cool and dry condition are desirable.

Soil

Loam, sandy loam and clay loam are suitable for soybean cultivation. In Kharif season, high land and the field should have an efficient drainage during growth period of the crop are good for cultivation and Rabi season, it can be cultivated in medium high land. Soil pH 6.0-7.5 is preferable.

Variety

Bragg, Devis, Shohag, Bangladesh soybean 4, BARI soybean 5, 6 etc.

Land Preparation

If there is a less moisture in the field one free pre-sowing irrigation should be given. 4-5 ploughing followed by laddering are enough to make the soil well pulverized for sowing soybean seeds. It requires deep ploughing. The weeds and stubbles should be picked up, collected and thrown out.

Seed Rate

- Shohag, bragg, Devis: 70-80 kg/ha.
- Bangladesh soybean 4: 40-50 kg/ha.

Seed treatment

For preventing fungal attack, treated the seed with Vitavax-200.

Time of sowing

- Rabi crop: Mid December - Mid January.
- Kharif crop: Mid July - Mid September (Late kharif sowing may be done upto 30 October).

Method of sowing

Line sowing is good but broadcasting can be done.

Spacing

1. Rabi crop-

- Row to Row: 20-30 cm.
- Plant to Plant: 4-6 cm.

2. Kharif crop-

- Row to row: 40 cm.
- Plant to plant: 4-6 cm.

Depth of sowing

- In heavy soil: 2-3 cm.
- In light soil: 3-4 cm.

Fertilizer Application

Fertilizer	Quantity (Kg/ha)
Urea	50-60
TSP	150-175
MoP	100-120
Gypsum	80-115
Boron	8-10

All fertilizer are applied in the final land preparation. Use biofertilizer @ 65-75 g/ 1 kg of seed during sowing the seed. If biofertilizer is used, no need to Urea fertilizing.

Intercultural operation

Weeding: Soybean is very sensitive to early weed competition. 1-2 weeding can be done. Weeding should be done at 20-25 days after germination. Other weeding 40-55 days after germination.

Thinning: If plant density is high, it need to thinning.

- In Rabi season: 50-60 plant/ Sq. meter.
- In Kharif season: 40-50 plant/ Sq. meter.

Irrigation

- Rabi crop: 2 irrigation- one of 20-25 DAS (before flowering) and other 55-60 DAS (Pod formation stage).
- Kharif crop: Drain out standing water.

Insect pest

Scorpion beetle, Cutworm, Leaf wrapping beetle, Stem fly beetle are major pest of soybean.

Control

- Use resistant varieties. e.g. Sohag, BARI soybean 6.
- Destroy the larvae with wrapped leaf.
- Clean cultivation should be followed.
- Spraying with Sumithion 57 EC/ Sevin 20 EC @ 1 litre of water in 2 times at 10 days interval.

Harvesting

1. Growth duration is 90-120 days.
2. When soybean plants mature, they start dropping their leaves, the leaves turn yellow and the pod become brown. At maturity pods dry out quickly.
3. At harvest the seed moisture content should be about 15 %.
4. The crop may harvested by hand, breaking the stalks on the ground level or by sickle.

Post harvest operation

Threshing and Cleaning: The harvested plants are to be well dried in the sun. After drying the crop may be threshed by beating pods with hand stick which separate the seeds fro the pod. If stalks are long, it may be threshed by bullock. The plant parts are then removed from the seed mixture and the seeds are clean by winnowing and sieving.

Drying and storing: Seeds are to sun dried at 2-3 days. The dried seeds are packed in polybag and then stored in close drums or tins. It is necessary to dry the stored seeds once a month during summer season in order to avoid pest attack.

Yield

Depending on variety the yield ranges from 1.8-2.1 ton/ha.

Production Technology of Sunflower

Scientific name: *Helianthus annuus*.

Family: Asteraceae.

Importance

Sunflower is one of the most important oil seed crop grown in temperate countries. It is a major source of vegetable oil in the world. Sunflower oil is considered as premium when compared to other vegetable oils. Sunflower is the oil of preference among the consumers the world over due to its health appeal. From 1975, it is cultivated as oil seed crop in Bangladesh. 40-45 % linoleic acid are present in Sunflower oil seed.

Origin

Asia or South or Central America.

Varieties

In Bangladesh Kironi (DS 1) and BARI sunflower 2 are cultivable varieties.

Climate

Crop requires a cool climate during germination and seedling growth. It requires warm weather from the seedling stage up to flowering stage and warm and sunny days during flowering to maturity. Sunflower is a photo-insensitive crop, therefore, it can be grown successfully in any season. Sunflower, unlike most other crops, is not affected with the season and day length. With the exception of freezing temperatures, the sowing of sunflower can be done in any month of the year.

Soil

Sunflower can be grown on a wide range of soils and tolerates a moderate pH range and some salinity. It thrives best on deep loam soils with good drainage and irrigation facilities. The optimum range of soil pH for this crop is 6.5 to 8.5.

Land Preparation

It needs to deep Ploughed land for sunflower cultivation. The land should be prepared by 4-5 ploughing, cross Ploughing with laddering.

Time of Sowing

It can be grown successfully in all season. Mid November to Mid December are suitable time for sowing. It can be also sown in Mid April to Mid May.

Method of sowing

It can be sown in line sowing.

- Row to Row- 50 cm.
- Plant to Plant- 25 cm.

Seed Rate

8-10 kg/ha. For BARI sunflower 2, 12-15 kg seed are required for 1 hectare of land.

Seed Treatment

Seed are treated with Vitavax-200 @ 3g/ kg of seed.

Fertilizer Application

Fertilizer	Quantity/ ha
Urea	180-200 kg
TSP	150-200 kg
MoP	120-150 kg
Gypsum	120-170 kg
Zinc Sulphate	8-10 kg
Boric Acid	10-12 kg

1/2 of Urea and all fertilizer are applied in final land preparation. Rest of Urea are applied in 2 times. One of applied in 20-25 DAS and others 40-45 DAS before flowering.

Intercultural operation

Thinning: Thinning can be done in 15-20 days after germination of seed.

Weeding: Weeding can be done in 2 times. One of 20-25 DAS and others 40-45 DAS.

Irrigation

For more yield, Irrigation can be done in sunflower field.

1. First irrigation- 30 DAS (Before flowering).
2. Second irrigation- 50 DAS (Flower initiation time).
3. Third irrigation- 70 DAS (Before maturity of seeds).

Pest and Disease

Sunflower beetles, Sunflower moths, Cutworm are main pest of sunflower.

♣ Cypermethrin 20 EC @ 2 mL/1 litre of water are applying 2 times in 10 days interval for sunflower beetles.

Sunflower leaf blight and sunflower root rot are main disease of Sunflower.

♣ Applying Rovral 50 WP @ 2% / L of water at 2-3 times in 10 days interval for leaf blight of Sunflower.

Harvesting

Time: After 90-110 DAS, it is proper time for harvesting. It takes about 80-90 days in Kharif, 105-130 days in Rabi and 100-110 days in spring season

Moisture content: The sunflower crop is ready for harvest when moisture in seed is 20 %.

Maturity Symptoms: Phenotypically the heads are ripe when back of the head turns yellowish brown. All heads may not be ready for harvesting at one time. Harvesting may, therefore, be done in two or three instalments to avoid shattering.

Threshing: The harvested heads should be dried well in sun and then only threshes by beating the centre of the head with a small stick. The commercial crop may be threshed with available threshers by reducing their speed. Further, sun-drying of the seed is desirable before storage or oil.

Yield

1.7-1.9 tones/ ha.

Production Technology of Castor

Scientific name: *Ricinus communis* L.

Family: Euphorbiaceae.

Importance

Castor is grown for its seeds. The oil extracted from Castor seed is being used widely for various purposes. It is used as a lubricant in high-speed engines and aero planes, in the manufacture of soaps, transparent paper, printing-inks, varnishes, linoleum and plasticizers. Castor seeds are also being used for medicinal and lighting purposes. The Castor may be used to make manure and plant stalks as fuel or as thatching material or for preparing paper-pulp.

Varieties

The varieties (cultivars) of castor differ in the branching habits of plant, colour of the stem and branches, the nature of capsules, duration, the size of seed and oil content. Here are some of the high yielding castor varieties available in India; NPH-1, GAUCH-4, YRCH 1, TMV 5, TMV 6, CO 1 and TMVCH.

Climate

Castor crop can be grown from sea level to altitudes of about 1000 meter (m.s.l). Castor crop requires a hot, dry climate with annual rainfall of 500-800 mm of which 500-600 mm is needed during the first 3 months of crop growth. Castor is an ideal crop for marginal lands of the Dry Zone where it can be grown under both rainfed and irrigated conditions. This crop is sensitive to high humidity and high temperatures above 40°C and impacts the crop yield.

Soil

Generally, Castor is cultivated in lands which are not suitable for commercial farming. Castor seeds can be grown on a wide range of soils which are fairly deep and well drained. The most suitable soils for castor cultivation are deep, moderately fertile with slightly acidic conditions and well drained sandy loam soils. The ideal soil pH of soils should be around 6.0 for better yield. However, it can be cultivated on soils with pH range of 5.0 to 8.5.

Land Preparation

Give 3 or 4 deep ploughings to loosen up the soil as this crop requires well pulverized 40 cm deep loose sub-soil for good seed germination. Land or seed bed should be weed free and any weeds from previous crops should be removed. The clods should be crushed by using a country plough or harrow with onset of monsoons.

Seed Rate

A seed rate of 10 to 12 kg is more than enough to cover 1 hectare land. Again, seed rate depends on cultivar (Variety) and sowing method.

Seed Treatment

It is recommended to treat the seeds with Carbendazim @ 2 grams/kg of seed for preventing seed borne diseases like root-rot and Alternaria blight. Soaking the seeds in water for 18 to 20 hours is advised. In rainfed situations, seed priming with 1% KCl for 3 hours and sowing 7 days before onset of monsoon is recommended.

Propagation

Propagation of Castor crop is done through seeds.

Sowing

Castor bean is usually planted just before the rainy season in the month of June. However, it can be cultivated throughout the year in areas where irrigation facility is available.

Spacing

- Row to Row: 90-120 cm.
- Plant to plant: 40-60 cm.

Sowing Method

The seed should be sown either by plough furrow or with a seed-drill or by hand-dibbling.

Intercultural Operation

Gap Filling: Gap fill should be carried out on the 15th day of sowing and simultaneously thinning should be done leaving one healthy plant.

Weed Management: Weed control is very important in any crop as it impacts the overall yield as weeds compete for nutrients, fertilizers, manures and water. One or two weeding and hoeings with bullock-drawn implements should be given and sometimes, the plants should be earthed up. Chemical weed control like weedicides can also be effective to prevent the weed growth. Apply pre emergence herbicide Pendimethalin @ 3 liter/ha or Fluchloralin @ 2 liter/ha on 3 days after sowing followed by hand weeding twice on 21 st & 40th day after sowing the seed.

Irrigation

Rainfed crops don't need any irrigation. However, in irrigated crop, water should be provided weekly twice. Frequency of irrigation depends on the soil type, climate and crop stage.

Inter-crop

Farmers can earn some extra income by going for inter crops. Groundnut/Peanut, black gram, green gram can be cultivated along with Castor crop. For every row of Castor, 6 rows of peanut or black gram can be cultivated. Intercropping of castor with Green gram or Black gram in 1:2 ratio is recommended for rainfed condition. Intercropping of castor with onion in 1:2 ratio by adopting 1.5 x 1.0 m spacing is recommended for irrigated condition.

Manures and Fertilizers

- ◆ Spread 12 to 13 tonnes/ha of well decomposed farm yard manure (FYM) or compost evenly on the main field before last ploughing and incorporate in to soil by working a country plough.
- ◆ Apply 25 kg sulphur/ha through gypsum at the time of last ploughing for higher castor yield. Timely application of manures and fertilizers ensures the good crop growth and yield.
- ◆ The castor crop requires a fertilizer dose of N: P: K as 40:40:20 kg/ha. As a basal application, apply full dose of 'P' and 'K' and half dose of 'N'. The remaining half dose of 'N' should be applied 1 month after sowing when the soil moisture is adequate.

Pests and Diseases

The common and serious pests in Castor cultivation are *capsule-borer* and *semi-looper*. To control these pests, dusting BHC 10% in early stages or spraying 0.1% Carbaryl on the crop should be carried.

The other soil borne diseases like *seedling blight* and *Alternaria blight* are also major concerns in Castor crop. Water logged areas, low-lying areas should be avoided to prevent the *seedling blight*.

Harvesting

Time: The maturity of the crop depends on the variety. Most of the improved cultivars mature in about 140 to 175 days.

Maturity symptoms: The easy indication of Castor maturity is when 1 or 2 capsules in bunch show signs of drying. The whole cluster should be removed and stacked. The harvesting of unripe capsules has an adverse effect on the oil content of the seed and these should be avoided. It is recommended to collect the fruits when they ripen.

Threshing: After collecting entire crop, it should be dried in sun for couple of days and threshing should be done by beating the dried capsules with the help of stick. In rural areas, farmers use bullocks for threshing these crops. Winnowing should be done in the usual manner. One can use Castor Sheller as well to separate the seeds.

Yield

Generally, yield of any crop depends on factors like cultivar (variety), soil type, irrigation, climate and cultural practices. On an average the following yield can be obtained.

- From rainfed crop: 250 to 500 kg/ha.
- From mixed crop: 100 to 200 kg/ha.
- From irrigated crop: 550 to 800 kg/ha.

Production Technology of Safflower

Local Name : Karadi, Kusum, Kardai, Kusumbha.

Family : Compositae.

Botanical Name: *Carthamus tinctorius*.

Origin

Abyssinia and Afghanistan.

Economic Uses of Safflower

1. Safflower is most important rabi oilseed crop.
2. It is grown mainly for edible oil and sometimes for dye purpose.
3. The oil is good for heart patients as it contains polyunsaturated fatty acids.
4. It is drying oil and hence used in manufacture of paints, varnishes, water proofing material, adhesives for glass etc.
5. The oil cake from decorticated seed is fed to cattle.
6. The leaves of young plants are used as vegetable.
7. Red and yellow dye obtained from the flower heads is used for colouring cloths.
8. It is grown as border crop to protect the main crop from domestic animals.
9. Dried stalks are used as fuel or for making paper.
10. Oil content of safflower is about 28 to 30 p.c.
11. Safflower oil does not increase the cholesterol level in human blood and hence good for health.

Variety

N-62-8, Sharda, Tara, Bhima, CT-11, N-300, N-7, Nira.

Climatic Requirement

- ◆ Safflower is grown in cool and dry climate.
- ◆ It is drought resistant crop.
- ◆ It is grown as rainfed crop in areas receiving about 1000 mm rainfall.
- ◆ High humidity and rainfall increases damage from fungal diseases.

Soil Requirement

- ▲ Safflower comes up well in well drained, fertile medium to heavy soils.
- ▲ It is grown on light alluvial and loam soil as an irrigated crop.
- ▲ It is grown mainly on black cotton soils as un-irrigated crop.

Preparation of Land

Safflower requires one deep ploughing once in 3 years followed by 2 to 3 harrowing. Collect the stubbles of previous crop and prepare clean seed bed. 5 to 10 tons FYM/ha. is added into soil at the time of last harrowing. As a mixed crop safflower shares the preparatory tillage, manuring and Inter-cultivation given to the main crop.

Sowing Time

Safflower is sown in the month of October – November.

Seed Rate

- ▲ As mixed crop: 8 to 15 kg/ha.
- ▲ As pure crop: 20 to 25 kg/ha.

Spacing

- 45 X 20 cm (Rainfed).
- 60 X 30 cm (Irrigated).

Seed treatment

Sowing is done with thiram @ 3g or captan @ 2.5 g/kg seed to control seed borne diseases.

Fertilizer Application

5 to 10 tons FYM/ha. is added into soil at the time of last harrowing.

The dose of fertilizer is-

a) Rainfed safflower: 25 kg N/ha.

b) Irrigated safflower: 50 kg N, 25 kg P₂O₅/ha.

Rainfed crop fertilizers should be applied at the time of sowing. In case of irrigated crop half dose of N and all P should be applied at the time sowing and remaining half dose of N at 30 days after sowing.

Irrigation

Safflower is a drought resistant crop hence generally grown as rainfed crop on stored moisture. As irrigated crop first irrigation is given before sowing. The other irrigations should be given at flowering and grain filling stage 35 to 40 days and 65 to 70 days after sowing respectively.

Crop Rotation

1. Rotations followed in safflower are:

i) Bajra /Jowar– Safflower.

ii) Mung/Udid– Safflower.

iii) Groundnut– Safflower.

2. It is grown as mixed crop with wheat, gram, rabi jowar etc.

3. It is also grown as inter crop and border crop.

4. As inter crop one to two rows of safflower are altered with six rows of main crop (2:6).

Intercultural Operation

As mixed or inter crop it receives the intercultural operations done for main crop. As pure crop, two thinning after 10 days and 20 days after sowing should be done to keep proper spacing. One weeding and 2 hoeing should be given at 15 day interval for removal of weed and alter the soil. At the age of 45 to 60 days tops of the plants are cut down called topping. The operation is carried out for more branching, flowering and ultimate yield.

Pests and Diseases

Important Pests of *Safflower Fly*, *Safflower leaf cutting caterpillar*, *Safflower aphids*.

1. Spraying of 0.07% endosulfan or 0.05% Malathion for *fly*.

2. Dusting of 10% carbaryl @ 20 kg/ha or spraying of 0.05% endosulfan for *leaf cutting caterpillar*.

3. Spraying of 0.03% dimethoate or 0.02% thiometon for two times at 15 days interval or Dusting of 10% carbaryl or 4% endosulfan @ 20 kg/ha. for *aphids*.

Important Diseases of Safflower are *Rust of Safflower*, *Bacterial leaf blight*.

1. Treat the seed with thiram @ 3 g/kg or captan 2.5 g/kg seed or Spray 0.3% dithane M-45 at 15 days interval for 3 to 4 times for *rust disease*.
2. For *Bacterial Blight*, Spray streptocyclin 500 ppm of 2 to 3 times.

Harvesting

Time: For grain purpose the safflower become mature in about 120 to 125 days. It is harvesting after drying of the leaves and capsules.

Method: Harvesting is carried out by uprooting the plants or by cutting near to the ground early in the morning when there is a dew on the plants. The plants are heaped for a few days for drying.

Collection of Dye from Flowers

For dye purpose the flower heads are plucked at 2 to 3 day interval and dried. The ray florets and disc florets are collected. The yellow dye is obtained by dissolving them in water. The remaining pulp is dried and made into small cubes and used for obtaining saffron red dye. The saffron red dye is obtained by dissolving them in alkali. The dye is used for colouring the cloths

Post harvest operation

Dried plants are threshed by beating with stick and winnowed to obtain clean seeds. For dye purpose the flower heads are plucked at every 2 days after flowering.

Yield

- i) Mixed crop- 125 kg/ha.
- ii) Sole crop- 500 to 800 kg/ha.
- iii) Dye purpose- 100 to 150 kg dried petals/ha.

Production Technology of Linseed

Local Name: Jawas, Alshi, Tisi, Moshina.

Family : Linaceae.

Botanical Name : *Linum usitatissimum*.

Origin: Afghanistan.

Economic Uses

1. Linseed is important oil seed as well as fiber crop.
2. In India it is mainly grown as oil seed crop and oil is used for culinary purpose.
3. The oil is drying hence mainly used for manufacturing paints, varnishes, oil cloths etc.
4. Oil cake is used as manure and cattle feed.
5. Seed is used for making chutnees.
6. In western countries it is mainly grown for fiber purpose for making linen goods.
7. Oil content of the linseed is about 35 to 42%.

Varieties

Some of Indian varieties are Malshiras-10, Sholapur- 36, N- 55, C- 429, RLC- 4 (Jagdamba). Nela is the approved variety in Bangladesh.

Climatic Requirement

- ▲ Linseed is a cool and dry season crop.
- ▲ The temperature ranging between 10°C to 25°C is good for growth.
- ▲ It is a drought resistant crop and grown as rainfed crop in areas receiving 650 to 1000 mm rainfall.
- ▲ It cannot tolerate heavy rains during growth periods.

Soil Requirement

Linseed can be grown on different types of soils except sandy and heavy clay. But it grows best in water retentive alluvial and deep black soils with good drainage. It is exhaustive crop and soil become linseed sick, if crop is grown on same field year after year.

Preparation of Land

Land is prepared by frequent harrowing in kharif when taken as first crop. Land is cleaned off by collecting and destroying the stubbles. 4-5 Ploughing and cross Ploughing is done for linseed cultivation. 2-3 laddering is done in this time.

Sowing Time

Mid October – Mid November.

Seed rate

1. For small seeded varieties: 10 to 15 kg/ha.
2. For big seeded varieties: 20 to 24 kg/ha.

Spacing

22 cm X 10 cm.

Seed treatment

Seed are treated with Bavistin @ 1.5 g/kg seed to control seed borne diseases.

Fertilizer Application

Linseed is generally not manured. But application of 40 kg N/ha. is recommended for getting better yield. Out of this 20 kg N is given at the time of sowing and remaining 20 kg N is given 35-40 days after sowing.

Irrigation

Generally linseed crop is taken as rainfed crop on the residual moisture. If sufficient moisture is not available in soil at the time of sowing, pre-soaking irrigation should be given. If irrigation facilities are available than two irrigations may be given. One at flowering stage and another at seed developing stage.

Pest and disease

Important Pests of Linseed are *Linseed Gall Fly*, *Linseed caterpillar*.

1. Spraying of 0.05% endosulfan or 0.03% dimethoate for linseed gall fly.
2. Spraying of 0.05% Malathion or endosulfan for linseed caterpillar.

Important Diseases of Linseed are *Linseed Rust*, *Wilt*.

1. Spraying of ditane M-45 @ 1250 gm in 500 lit. water/ha for Rust disease.
2. Seed treatment with bavistin @ 1.5 g/kg seed. for prevent wilt disease.

Harvesting

Maturity: Linseed crop matures within 100 days after sowing. Harvesting is done when plant turn golden yellow and the capsules turn brownish and begins to dry up and open.

Method: The crop is harvested by pulling or cutting the plants at base. The plants are stacked on the threshing floor to dry. When most of the capsules are opened, threshing is done by beating with a stick or by trampling under the feet of bullocks.

Post harvest operation

Winnowing is done to clean the grain from chaff. For fiber it is harvested at capsule maturity when the crop is still green.

Yield

1. Rainfed crop: 300 to 500 kg/ha.
2. Irrigated crop: 800 to 1000 kg/ha.

Production Technology of Groundnut

Common name: Groundnut/ Peanut/ Monkeynut.

Scientific name: *Arachis hypogaea*.

Family: Solanaceae.

Groundnut is an important oil seed crop. It is also best edible oil crop. Although the quality of groundnut oil is superior to mustard oil but it is not popular in our country as cooking oil because of its consumption habit. It is mainly consumed as roasted nut and as a confectionary item.

Origin

The primary center of origin are southern Bolivia and northern Argentina. The secondary center of diversity are other south American countries like Peru, Brazil.

Variety

BARI China badam 5, BARI China badam 6, BARI China badam 7, BARI China badam 8, BARI China badam 9, Dhaka 1, DG 2, DM 1 (Tridana), Acc 12 etc.

Climate

- Groundnut is essentially a tropical plant and requires warm growing season.
- In 107-114 cm rainfall, groundnut successfully grown.
- Groundnut tolerate heavy rainfall up to 152 cm.
- Optimum temperature for growth 25-30°C.
- Below 20°C retards development.
- Above 35°C adversely affects flower production.

Soil

Light, well drained, Sandy loam or sandy soil of char (River embankment) area are suitable for groundnut production. Soil should be soft and loose so that gynophores of groundnut flower can easily penetrate the soil and go down to form nuts.

Land Preparation

Although, groundnut is a deep rooted crop, looking to its under ground pod formation habit, deep ploughing should be avoided. Besides soils of char area are very loose, so 3-4 ploughing followed by laddering are sufficient. Irrigation and drainage system could be developed by making canals after final ploughing and laddering.

Seed rate

Seed rate depends on germination of percentage. However 95-110 kg/ha is optimum.

Seed treatment

Pre-sowing seed treatment with Vitavax-200, 2-3 g/ kg of seed or Agrosan, 4 mg/ kg of seed could reduce the disease infestation.

Time of sowing

Groundnut could be cultivated in both Rabi and Kharif season in Bangladesh.

▲ In Rabi season: Mid October - Mid November.

▲ In Kharif: July - August.

Sowing method

Seeds should be planted in rows.

Spacing

1. In general- (for all the varieties)

- Row to row distance is 30 cm.
- Plant to plant distance is 15 cm.

2. In Tridana variety (DM-1)-

- Row to row distance is 25 cm.
- Plant to plant distance is 10 cm.

3. Seeds should be placed at 2-3 cm depth of soil.

Fertilizer dose and application method

Groundnut plant itself fixes atmospheric nitrogen. So, the requirement of urea for this crop is very low. However, the fertilizer dose is-

Fertilizer	Quantity
Urea	25-30 kg/ha
TSP	150-170 kg/ha
MoP	80-90 kg/ha
Gypsum	160-180 kg/ha
Zinc sulphate	4-5 kg/ha
Boric acid	9-11 kg/ha

All fertilizers should be applied before final land preparation.

Intercultural operation

Weeding: The seeds of groundnut within 2 weeks after sowing and start flowering 1 month later. Normally 1-2 weeding should be done. During weeding soil is loosened and earthing up is done by spade. The first spading is done 3 weeks after sowing and Second 3 weeks there after. Care should be taken not to disturbed the soil after flowers have set.

Irrigation

There is no need of irrigation in the soil of char area but in the high land where soil becomes dry quickly are required 1-2 irrigations.

♦ In Rabi season, 2-3 irrigation can be done: 1st at 25-30 DAS, 2nd at 50-55 DAS and 3rd at 75-80 DAS.

♦ In kharif-1 (summer, March-June) season: 1 irrigation should be required depending on the field condition.

♦ In kharif-2 (summer, July-November) season: there is no need of irrigation. But Drainage may be needed to drain out excess water.

Pest Management

Major insects: Hairy caterpillar, Jassids and Thrips.

Control measures

♣ In case of hairy caterpillar insect infestation, leaves of infested plant should be destroyed along with the eggs and larvae of insects.

♣ For adult insect control, Ripcord 10 EC or Nogos 100 EC should be sprayed @ 1 ml of insecticide with one litre of water.

♣ Diazinon 60 EC @ 2 ml per litres of water should be sprayed to control Jassids and thrips.

Harvesting

Maturity symptoms: When plants become mature, the leaves of the lower parts of plants become yellow. Surface of pods become rough and hard, veins become prominent, inner surface of pods shell becomes blackish in colour. Cover of kernels become brown in colour. These are the ideal condition when the crop is ready for harvest.

Maturity time: Early variety: 120-135 days, Late variety: 150-180 days.

Method: Groundnut can be harvested with a country plough or spade.

Post harvest Operation

Threshing: The harvested crop should be kept in small heaps for 2-3 days for curing. After curing the nuts are to separated from soil and soil adhering to the nuts should be removed.

Drying: Pods should be dried for 8 hours after harvesting. Moisture content of pods should be 8-9%. Seeds should be cooled and then stored after sun drying.

Storing: For storing groundnut, different types of containers may be used. If seeds are stored in air tight condition whether polythene bags and synthetic bags, the quality of seeds and viability of seeds are restored for more than one year but during rainy season, seeds should be checked and dried and kept in the same container.

Yield

2.5-3 ton/ha.

[Http://Studyag.blogspot.com](http://Studyag.blogspot.com)